

Dwarf Seahorse Biological Assessment IQA ID239
Biological Report – Peer Review Report

Peer Reviewers:

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Peer Review Directive:

1. Please provide comments on the scientific information and data contained within the biological assessment for the dwarf seahorse (*Hippocampus zosterae*).
2. If you believe that justification is lacking or specific information was applied incorrectly in reaching specific conclusions, please specify.

Comments on Biological Report Sections

Taxonomy and Anatomy

- Why brackets? The format for scientific names is genus species author(s), date. The authors name(s) are in parentheses if the genus has changed from the original description
- I would use the counts presented in Vari (1982), i.e., 9-11 trunk rings (11 rare); 10-13 dorsal-fin rays, modally 11; 10-13 pectoral-fin rays.
- This is not indicated in Figure 1.
- Twigs?? In the water?
- Seagrass is normally one word.

Habitat use and Migration

- As I mentioned in my previous e-mail this is incorrect. This is not your mistake; it is a mistake by Lourie et al. (1999). The distributions of *H. zosterae* and *Zostera* do not overlap. The original authors of the species name (Jordan and Gilbert, 1882) did not know that the southern seagrass was not in the genus *Zostera*. From the remainder of your report, one can deduce that *Zostera* is not a major habitat.
- Seems odd based on the limited geographic range and lack of offshore specimens
- I do not think this is true. See comment above.
- No matter what the sources say, *Zostera* is not a genus of seagrass present in the GOM or Caribbean, nor on the east coast of Florida. The species may have gotten its name from either a broader historic distribution up the east coast of the US or just as a misnomer, because they are NOT commonly associated with this genus. Most commonly associated with *Thalassia* and *Syringodium*, with some observation in *Halodule* and *Ruppia*, with *Halophila* association very uncommon
- We need to be cautious here with the language – the data set on movement patterns of seahorses worldwide is VERY small
- This is from work that B.Froeschke (USF) and I are currently working on – data collected in 2010 in Port Aransas Bay Texas in addition to a data set collected between 2003-2007 in both Tampa Bay and the Florida Keys
- It would seem more reasonable to me that you would start with a mention of the biogeography of the species first. What is its geographical distribution?
- This is somewhat of a vague term. Generalists is used in a number of ways? Specifically, do you mean generalist in the distribution context.
- Who is this? What about an institutional affiliation. I could not verify this pers com, I have no idea who mark fisher is
- Commonly used term disguised to have some scientific credibility. To me, it appears means, well maybe. Wouldn't it be more credible to assess the state of the uncertainty in

this knowledge rather than say it appears. What is really apparent is that there hasn't been a lot of work done on the species with regard to temperature and salinity.

- Seagrass blades and seagrass shoot density are two different things. A blade is typically a leaf, but a shoot is several leaves. So I wonder if these two numbers are being properly compared here.
- Seagrass shoots are uprooted and leaves broken off, these are potential mechanisms of dispersal.
- I could not conclude that from the information you have provided. I would conclude that if this is a comprehensive review, we probably know very little about this species habitat requirements.
- Something is missing here

Diet and Feeding

- Maybe try to reword this. Also, do you really want to speculate in the document? Maybe just say that it can vocalize but the implications for this are unknown.
- Their mouths are small but they can open them.

Age and Growth

- 200 mm? Is this correct?
- Is this a typo? There is no way that an animal of this species would ever reach 20 cm.
- The maximum adult size we have observed across all of our Florida sampling is 54 mm (male, Fort DeSoto, FL) total length, from tip of snout to back of operculum and down to tip of tail along the animal midline – combination of head length and total length, but a better comparison measurement to standard length measurements of other fish species.
- What about mode of reproduction first? It may have very important implications.
- Unusual table format with duplicated headings.
- Everything varies, by what? What metrics are you focusing on
- Season is not very quantitative, do you mean temperature, daylength, etc? Looks like you mean precipitation.
- Lifespan would be the demography of the species.
- Where was that?

Reproduction

- Breeding season likely varies across the range of this species, with gravid males present in the population year round in the Tampa Bay population. However, the frequency of gravid males drops in the Tampa population during Oct-January from mean ratio of gravid:nongravid males of 0.5 (half males carrying offspring and half not) to ratio of 0.15 (85% of males non-gravid). See slide 17 of attached powerpoint file for graphical support.

- Genetic work with this species is ongoing with one of my collaborators – Emily Rose from Texas A&M (erose@mail.bio.tamu.edu). If I get an update on her project this week I will send it along to you.
- This section needs to go first, then discuss the demography of the species.
- How do they breed should come first.
- Interesting. This would have implications if environmental conditions promoted differential growth rates in a population. Size distributions as frequencies would be a very important metric.
- Sexually mature?
- still don't know what their biogeography is so is this sample from Key Largo representative of the middle of their range, the north, the south, etc.
- Sexual maturity?
- This needs to come earlier.
- With such a short life span it makes sense, you don't have time to search around if you want to propagate your genes
- So, possibly climate change will affect this species?????

Demography

- But in the first sentence you state the only study for the dwarf seahorse with a much higher rate. So, I am confused by this statement. How reliable are the models.
- Why particular areas? Are you implying a patchy distribution?
- Maybe this should be stated explicitly, what is known about the patch distribution?
- It appears that the text is confusing fecundity with productivity. I view these as two distinct processes.
- Ok, finally, patchy distribution, but what are the data supporting this?

Distribution and Abundance

- Musick et al. (2000) is not well-supported and I have not seen Alford and Grist (2005).
- As I mentioned in my previous e-mail, museums do relatively little collecting. Specimens are collected by individual researchers or groups and deposited in museum collections.
- In June 2003, we conducted field work in the Keys, and collected 44 animals from Card Sound. For site data and details, please see the attached data set, with relevant location data in columns in Yellow, with region, location, and coordinates labeled in columns A-F. Please do not circulate data – we are currently writing it up for publication. A separate data set is attached for body sizes of the Keys animals.
- I know about this database, but I don't know that you have defined it anywhere previously in the text.
- This comparison would be much easier to follow if numbers were converted to the same units.

- How about the fishery?
- I did not recheck Powell et al. (2002), but the mesh size in cast nets is usually much too large to capture this species. Were these throw traps?
- I am not sure what this means...I would call museum records scientific collections.
- I worked with a supplier at the time (Aqualand Pets, based in Marathon, FL) that collected these animals. Animals collected in the middle and lower keys during our June 2003 field season are included in the two data sets that I attached to this email. A total of 30 animals were collected from Long Key down to Bahia Channel, with specific location data available in data set FL SYN ENV data set attached.
- We captured 891 animals during this period at our single field site during this 1 year period
- This was a small regional scale project, but we caught 69 animals during the 10 week study and recaptured 27 of those animals repeatedly over the 10 weeks.
- A study conducted in 2010 in Aransas and Copano Bays in TX by B Froeschke collected 14 dwarf seahorses. See attached PDF of talk I gave March 2013 which includes the outcomes of this study, currently being written up by B. Froeschke and I.
- Distribution is mentioned in the previous section. I wonder if this whole section should be presented earlier?
- At the current time, is it standard practice to list this here or should there be a methods section earlier in the document describing how information was obtained?
- It seems to me that the listing would depend on the reliability of this information. I think you need to come up with a justification for the strength of these data and the assessment of the data.
- They are not ON the island.
- Who is this, doesn't this need some affiliation or contact information
- Can this be updated with current information. I think the seagrass reduction is actually greater now. Contact Lori Morris at SJRWMD.
- Relative to what? What is the reference density?
- Who and where is he? I think these pers comm references need more information. How could someone verify this pers comm?
- How were they captured? It will be difficult to put these numbers into a context of abundance. What was the effort?
- Better, but where?
- What is the GBIF data base?
- You need to explain in the legend what the column headers are. Also there are two tables here but a missing legend
- No column headers in table below.
- What are the units in the legend?

- Also, isn't this figure and the next the same data as in the tables? If so, why present the data twice. Maybe put the table in an appendix?
- 4 stations? How can this be representative of the Florida Bay. This is a very small sample size.
- What is the origin of these data?
- What are the error bars?
- Per what? Set?
- Can you compare these data with the Fishery independent sampling to gain some confidence about abundance?
- Why isn't there a plot of relative index just like figure 6?
- Messy graphics, very hard to read and understand the x axis. Graphs borrowed from a study like this without cleaning them up is not a very good presentation.
- Whole state?
- The records or the fish?
- Looks like the species has a very wide salinity tolerance.

Summary of Distribution and Abundance

- You also looked at several surveys.
- Do you mean the open Atlantic?
- What time?
- What is this area specifically.
- It seems like this sentence should be in the threats section.
- What areas? Subject matter seems to be jumping from one topic to the other.
- This seems like a weak assumption.
- This seems like speculation based on insufficient data.
- This is probably a good assumption.
- Chandeleur seagrass is on a significantly declining trend.
- Are you referring to the three larger areas or portions of each of the three larger areas?
- Well, not sure what you meant here, but there are huge areas of seagrass in the Bahamas and Mexico. Have you actually established the strict dependence of the dwarf seahorse on the presence of seagrass?
- What about the catch indices?
- Are records really a reliable source of data for population abundance and trends?
- Might want to mention the idea of appropriate survey techniques here.
- There is little doubt that both locations still have seagrass. Maybe you could say "appropriate seagrass habitat still exists".
- I guess this statement rests on what you call long-term...the FIM dataset if fairly long-term.

- I would not call the neonate stage planktonic larvae, and there is very little evidence that this species is a good disperser. There is certainly more evidence for dispersal in lined seahorses, for example.

Threat to Dwarf Seahorse Habitat

- actually increase flashiness of runoff
- I don't know that everyone concluded that algal blooms were the cause, rather than a symptom. Also, the loss was only in certain portions of Florida Bay.
- not all gears in list are trawls
- Need to standardize units; switching back and forth is confusing.
- Seagrass trends "up or down?"
- Poor water quality is a very general term for many specific factors. It won't help managers to vaguely state this? Is it nutrient enrichment, sediment loading, water management etc?
- Low mobility "I agree with this, but it contradicts earlier statements."
- Considered extirpated by the Bermuda government "It was almost never there!"
- Coastal development is an indirect cause, it is the consequences of coastal development which cause declines; e.g. poor water quality. Poor water quality resulting from coastal development.
- I don't think the documents has done a very good job of establishing the dependence of the seahorse on seagrass, YET! This needs to be better articulated before making this statement.
- Also nutrients, dissolved organic matter.
- These are some of the details following the opening sentence, but how many of these do you want to specify, the list is long and poor water quality captures a lot of them.
- Also causes production of excess organic matter whose decomposition reduces oxygen in the water and the sediment and has a significant negative impact on the vegetation and the animals using the habitat.
- Many areas it isn't appearing, but has already occurred. Many in the range of the seahorse, but this sentence is vague
- Marine waters? What is the source of this assessment? The 2008 document below, if so, probably should cite it here.
- These statements cannot both be true.
- This is the increase in landings, not what it is "attributed to".
- Pollution, a very old term used to lump all the bad stuff into one category, but today this would be a vague statement. We know what pollution specifically affects seagrass.
- What is this referring to?
- Very doubtful based on their abundance in the Bahamas.
- Where would we import them from?

- Are there data in this regard?
- What is a “smaller habitat”?
- There are more relevant studies from florida and the gulf of mexico that you could cite here, rather than just Bermuda, especially since this is the U.S. ESA How about Florida Bay and the IRL? Right now the IRL is going down the tubes with almost 80% of the seagrasses lost.
- I don’t know that anyone thinks this was the primary cause, and earlier in this document it was blamed on an algal bloom.
- This does not occur in the single biggest habitat for this species, Florida Bay
- Florida Bay is part of the Everglades National Park. Are you sure trawling still occurs there?
- Were they really heads? If so, they were not for the aquarium trade. Should the above statement be” 50,000 head” as in 50,000 individuals?
- But I thought Tampa bay was recently considered a big success story with seagrass recovery?
- These, referring to Tampa Bay.
- Referenced here it would imply we said something specific about the seahorse, but I don’t believe we did.
- Laguna madre also had a ten year brown tide which had a big impact on seagrass. Also this sentence infers a direct relationship between seagrass decline and seahorse decline, I am not sure you have the data to support this.
- Were seagrasses involved here?
- This section places and extraordinary emphasis on petroleum operations that I am not sure is justified. It is also problematic that it places so much emphasis on DWH where the data are still tied up potential litigation and are not readily available for this review. What about the other oil spill which have occurred in seagrass systems?
- Not sure why this sentence is relevant here.
- Is there documentation of this, or for any of the material in this paragraph?
- What is the documentation supporting this?
- What is the point being made by this paragraph?
- The resolution of this display would imply complete saturation in some areas of the northern gulf. I think this is misleading.
- don’t think all of this discussion of DWH is especially relevant. Why are you restating the story about the spill?
- Starting with the next sentence the text deviates from the topic sentence
- There are other published studies of oil spills in seagrass habitat, why haven’t you used them? You cannot use the DWH injury assessment results bu tthe aerial imagery is already publicly available.
- I don’t see the relevance of this paragraph to the status review.

- Then what is the relevance of all this DWH discussion.
- might be more relevant to generalize this discussion to petroleum and dispersant toxicity and mention the magnitudes for DWH
- don't think it is appropriate to lump the seahorse and the habitat for this discussion, in fact I think it is a mistake because it is entirely possible that much smaller amounts of either potentially toxic material could be more lethal to the seahorse than the seagrass. Especially since there is very little evidence for the seagrass.
- Specific areas where the SAV TWG worked?
- Referencing this paper here implies that they looked at toxicity, however, they didn't. They sampled fish with trawls and it had nothing to do with lethality. They did mention this subject with respect to their results but this was not the objective of that study.
- What is DWSF?
- What is not proven?
- What about fishing gear, you mentioned that earlier.
- Introducing common names here. Is that appropriate?
- Onuf published several articles on dredging, light and seagrass declines in Laguna Madre that are direct references to work actually done. Handley et al. is a summary and review.
- Were there temporal gaps like this in the earlier record making this correspondence with the bloom and seagrass decline unique.
- You should also mention hull groundings which are actually much more severe than prop scars and can take decades to recover. Sometimes they never recover.
- Seems like you are trying to say "repeated trawling in the same area"
- This is confusing. Is it less destructive yet still damages seagrass?
- What disturbances
- really wonder how valid this reference is for seagrass specifically?
- Don't confuse the term density with acreage.
- This is well documented now, you should consult Lori Morris, SJRWMD.
- This is more than status, this is speculation on reasons for change.
- 15 years between the data and the reference. The situation could be very different now.
- Not according to Larry Handley for the Chandeleurs.
- What these? The fairly consistent beds or the declining beds.
- Check with Don Field at CCFHR, NOAA, there is a recent survey.
- This is a magazine article, why not use the science? Waycott et al.
- Is this speculation?
- What is done with the recreational catch?
- This would be relevant if you had some justification for expecting this demand in the future.
- Believed is used often in this document but it is not a very scientifically appreciated term and even may not constitute a defensible assumption or hypothesis.

- The use of the word United States and throughout this section gives the impression that this is a national problem, when in fact it should be stated as something more specific like “the aquarium industry”. The use of United States implies some collective process but it is really the industry that should be cited.
- It is interesting that with so many caught each year, why haven’t the people interested in learning more about distribution, abundance and biology used this resource to learn more about seahorses.
- Documented exports??? Is there a potential for a black market of undocumented exports.
- Wow, there is no customs monitoring of the import of live animals? Are you sure? No wonder the lionfish has become such a potential problem.
- You need to cite this website and correctly by indicating that last date you accessed it. Web site citations can be very messy business and misleading. Be specific so the reader can get to the information.
- Need to say what Hz is in the legend. Abbreviations must be defined everywhere in this text.
- Is this historical information relevant? Probably, but in what context. Were populations likely to be much larger in the past and reduced by harvest which now effects the population? What are the implications of the historical data?
- You should mention they are sedentary and vulnerable to capture in this type of gear. No net avoidance capabilities.
- Is this level of detail necessary? Can’t all of these gear be considered shallow water < some specified depth?
- How do you know this? No citation provided. It seems like a level of understanding that would need some documented support.
- What is a smaller habitat? Less seagrass, smaller seagrass species? This is pretty vague.
- What is imported, the traditional medicine or the sea horse? This needs two sentences or proper identification of the subject.
- Interesting comment. What is a significant portion of the population? Does the bycatch take this? Does the TCM take this?
- This is not correct. Seagrasses are very resistant to storms and hurricanes. These citations speculate on storm effects and do not provide adequate empirical data.
- What shifts? You listed several possibilities in the previous sentence, however, this paper does not address all of them. In fact, this paper actually only hypothesizes that shifts in community composition of fish communities in the northern may be related to climate change and they do not specify things like climate change. I think you are overextending the implications suggested by this paper.
- I don’t agree that this reference supports this statement.
- The slime mold was implicated as a possible contributor to the decline but we have never explicitly documented that it destroyed turtle grass. This is an overstatement of the scientific facts.

United States Regulation

- Another example of where I can't tell whether you are referring to marine life capture in general or to the seahorse, until I get to this point in the paragraph.
- I wonder how this was determined considering it is a restricted species
- This is all running together. I think it would be important to state up front that the fishery for seahorses is lumped into the collective harvest of all SPL and MLE activities. There is not special accommodation for seahorses.
- This is confusing, I thought you stated above that there were some constraints and limitations.
- But does it occur in by catch.
- What is a range state?

Mexico: Species Protection

- Interesting, so the by catch can be exported.
- How is an endangered aquatic species different from an endangered species?

Bermuda

- The better terminology might be that used by Smith-Vaniz et al. (1999) in their book about Bermuda fishes. They do consider the species to be established in Bermuda...and it probably never was.

Bahamas

- How is this relevant to the seahorse?
- Ok, so how is this relevant to the seahorse? Are you suggesting that these MPA's protect them? If you are, say it.

Cuba

- So, do these protect seahorses? I think you need may be needing to make the argument that there is something about the reserves that are relevant to the seahorse.

Coastal Management Regulatory Mechanisms

- So, what implications does this have?
- Again, what are the specific implications with regard to the seahorse?
- Have you adequately made the argument of seahorse dependence on vegetated habitat?
- This is really the only mention of relevance to seahorses, even still it is a vague acknowledgement as to what the CZMA actually means to this process.
- The FKNMS does have a management plan that recognizes the abundance and extent of seagrasses.
- What is the relevance to seahorses.

- You mention how many sanctuaries are in seahorse territory so I wonder why you don't mention how many national parks are within seahorse territory. There are more for sure and this may be a relevant point since these are areas where critical habitat will receive the highest protection; federal jurisdiction.
- I wonder if Florida will follow suit and list the seahorse if in fact it does get listed. They didn't with Johnson's seagrass. How relevant is this to the discussion of status?

Conservation Efforts

- What about all of the seagrass conservation efforts that are touted by federal and state agencies. Don't these apply here. Thus far it seems that seagrass is a pivotal aspect of this status review so conservation of seagrasses should be acknowledged here..